L 26603-66 EWT(m)/ETC(f)/EWG(m) RM/DS

ACC NR: AP6008978 SOURCE CODE: UR/0190/65/007/011/1941/1945

AUTHORS: Tolmachev, V. N.; Kolesnikova, B. M.; Bobok, Ye. B.

46
B

ORG: Khar'kov State University im. A. M. Gor'kiy (Khar'kovskiy gosudarstvennyy universitet)

TITLE: The acid and other physico-chemical properties of polystyreneazosalicylic acid, polystyreneazocresol, and polystyreneazophenol

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 7, no. 11, 1965, 1941-1945

TOPIC TAGS: polymer, ion exchange, ion exchange resin, polystyrene, organic synthetic process, chemical absorption, nonmetalic organic derivative

ABSTRACT: The work of V. G. Sinyavskiy, A. I. Turbina, and M. Ya. Romankevich (Dopovidi AN URSR, 1963, 613) was extended by synthesizing the ion exchange resins: polystyreneazosalicylic acid (PSASK), polystyreneazocresol (PSAK), and polystyreneazophenol (PSAF). The synthesis was carried out after the method of B. N. Laskorin, P. G. Ioanisiani, N. L. Alekseyeva, G. N. Nikul'skaya, and K. F. Perelygina (Zh. prikl. khimii, 34, 881, 1961). The potentiometric titration curves, ion absorption capacity as a function of the pH of the medium, and pK values for the synthesized compounds were determined. The experimental results are presented in graphs and tables (see Fig. 1). It is concluded that the synthesized resins are good absorbers of copper ions from ammonia solution.

Card 1/2 UDC: 678.01:54+678.746

L 20005-66

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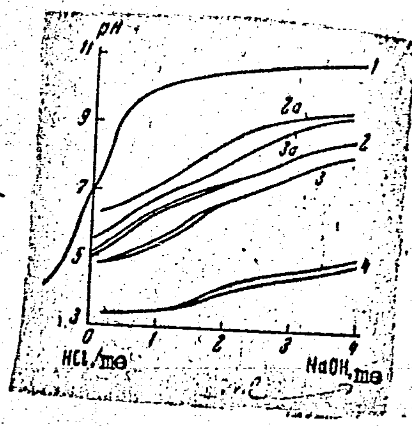

Fig. 1. Potentiometric titration curves:
1 - blank solution, 2 - PSAF, 0.2 g;
2a — PSAF, 0.1 g; 3 — PSAK, 0.2 g;
3a — PSAK, 0.1 g; 4 — PSASK, 0.2 g.

Orig. art. has: 2 tables and 1 graph.

SUB CODE: 11,07/ SUBM DATE: 21Dec64/ ORIG REF: 011/ OTH REF: 005

Card 2/2 BLG

TOLMACHEV, V.S.

Incidental statement of problems of the extraction and transportation of gas in technical literature ("Extraction, transportation and reprocessing of natural gas." Reviewed by V.S.Tolmachev). Neft.khoz. 32 no.7:91-93 Jl '54.
(Gas, Natural) (MLRA 7:8)

TOLMACHEV, V. S.

Subject : USSR/Miscellaneous AID P - 561

Card 1/1 Pub. 78 - 27/29

Author : Tolmachev, V. S.

Title : Supplemental discussion of problems on production and transportation of gas as outlined in the technical literature

Periodical : Neft. Khoz., v. 32, #7, 91-93, Jl 1954

Abstract : Critical review of the technical literature on the production and transportation of gas. Advance of the knowledge of gas prospecting and production justifies separation of this problem from similar problems on combined oil and gas exploitation. 5 Russian references.

Institution : None

Submitted : No date

APPROVED FOR RELEASE: 07/16/2001 CIA-RDP86-00513R001756110012-7"

TOLMACHEV, V.S.

Equipping gas wells with pump and compressor tubing. Neft.khoz. 32 no.11: 43-45 N '54.
(Gas, Natural) (MLRA 7:12)

TOLMACHEV, V.S., inzhener.

Some problems in conducting standard trials of gas wells and establishing an efficient rate for their operation. Trudy Akad. neft.prom. no.1: 247-278 '54.
(Gas, Natural) (MLRA 8:2)

TOLMACHEV, V.S.

Subject : USSR/Mining AID P - 1133

Card 1/1 Pub. 78 - 11/25

Author : Tolmachev, V. S.

Title : Pump and compressor pipe in gas wells

Periodical : Neft. khoz., v. 32, #11, 43-45, N 1954

Abstract : The author discusses various conditions under which pump and compressor pipe should or should not be installed in gas wells. The author also suggests that all drilled wells be submitted to special tests for obtaining information for further planning of the drilling.

Institution : None

Submitted : No date

TOLMACHEV, V.S.; BELOV, K.A.

Greater use of local gas reserves. Gaz.prom.no.5:8-9 My '56.

(Gas, Natural) (MLRA 10:1)

TOLMACHEV, V.S.

Several shortcomings of the casing of exploratory gas wells. Gaz.prom. no.3:7-10 Mr '56. (MIRA 10:1)
(Gas wells)

SMIRNOV, Aleksandr Sergeyevich, d-r tekhn.nauk, prof.; SHIRKOVSKIY, Arkadiy Iosifovich, kand.tekhn.nauk; TOLMACHEV, V.S., inzh., retsenzent; MARTYNOVA, M.P., vedushchiy red.; MUKHINA, E.A., tekhn.red.

[Production and transportation of gas] Dubycha i transport gaza. Moskva, Gos.nauchno-tekhn.izd-vo neft.i gorno-toplivnoi lit-ry, 1957. 557 p. (MIRA 11:1)

(Gas, Natural)

Tolmachev, V. S.

PHASE I BOOK EXPLOITATION 313

Smirnov, Aleksandr Sergeyvich, Doctor of Technical Sciences, Professor, Shirkovskiy, Arkadiy Iosifovich, Candidate of Technical Sciences

Dobycha i transport gaza (Gas Production and Transportation) Moscow, Gostoptekhizdat, 1957. 557 p. 5,000 copies printed.

Reviewer: Tolmachev, V. S.; Ed.-in-Charge: Martynova, M. P.; Tech. Ed.: Mukhina, E. A.

PURPOSE: The book is intended as a textbook to be used by students in petroleum vuzes and departments of polytechnic institutes. It can also be used by specialists in the field of natural gas production and transportation.

COVERAGE: The author analyses the physical and chemical properties of natural gas, and goes into gas dynamics, the exploitation of gas-condensate reservoirs, and the problems involved in the transportation, refining, supply, storage and transportation of natural gas and petroleum and petroleum products. Dotsent B. M. Rybak, Assistant

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Gas Production and Transportation 313

Director of Scientific and Educational Work at the former Academy of the Petroleum Industry, and Professor I. M. Murav'yev, Assistant Director of Educational Work at the Moscow Petroleum Institute, helped in preparing this volume. There are 114 references, 81 of which are Soviet and 33 English.

TABLE OF CONTENTS:

Card 7/8

AVAILABLE: Library of Congress

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BK/vm
6-4-58

APPROVED FOR RELEASE: 07/16/2001 CIA-RDP86-00513R001756110012-7"

TOLMACHEV, V. S.

TOLMACHEV, V.S.

[redacted]

Exploitation of the Severo-Stavropol gas field. Gaz. prom. no.2:5-9 F '58. (MIRA 11:2)

(Stavropol Province--Gas, Natural)

APPROVED FOR RELEASE: 07/16/2001 CIA-RDP86-00513R001756110012-7"

TOLMACHEV, V.S.

Designing fittings for flowing gas wells. Gaz.prom. no.12:13-16
D '58. (MIRA 11:12)
(Gas, Natural) (Oil wells--Equipment and supplies)

TOLMACHEV, V. S.

Evaluation and accounting of gas losses in gas fields. Gas.prom. 5 no.4:6-11 Ap '60. (MIRA 13:8)

(Gas, Natural)

GARBUZ, N.A., doktor tekhn.nauk, prof.; TOLMACHEV, V.S., assistent

Machining weld-up "sormite." Izv.vys.ucheb.zav.; mashinostr. no.7: 107-112 '60. (MIRA 13:11)

1. Irkutskiy gorno-metallurgicheskiy institut.
(Metal cutting)

TOLMACHEV, V.S.

Uneven perforation of producing layers in gas wells. Izv. vys. ucheb. zav.; neft' i gaz 3 no.8:123-128 '60. (MIRA 14:4)
(Gas wells)

TOLMACHEV, V. S.

Cand Tech Sci - (diss) "Study of the treatment by cutting of fused-on wear-resistant hard alloys in the heated condition." Irkutsk, 1961. 25 pp; (Ministry of Agriculture USSR, Irkutsk Agricultural Inst); 150 copies; price not given; (KL, 5-61 sup, 194)

TOLMACHEV, V.S.

Depth of tubing in a gas well. Gaz. prom. 6 no.12:1-7 '61.
(MIRA 15:2)

(Gas wells)

TOLMACHEV, V.S.

Hydraulic fracturing in the gas wells of the Stavropol field: a topic for discussion. Gaz. prom. 8 no.2:9-13 '62. (MIRA 17:6)

SMIRNOV, T.G.; TOLMASHEV, V.T.

Simple and safe devices. Bezop.truda v prom. 4 no.12:32 D '60.
(MIRA 14:1)

(Tools)

TOLMACHEV, V. V.

USSR/ Physics - Bose gas

Card 1/1 Pub. 22 - 16/47

Authors : Tolmachev, V. V.

Title : Computation of the time-correlation function for weak non-ideal Bose gas

Periodical : Dok. AN SSSR 101/6, 1039 - 1042, Apr. 21, 1955

Abstract : A computation of the correlation function dependent on time, G(r,t), is presented. The computation of the function G(r,t) is accomplished for a feebly degenerated, weak non-ideal Bose gas on the assumption that the wave functions (expressing the Bose gas system), being determined with the Bogolyubov-Zubavev method of complementary variables, are known up to the first approximation. Eight references: 4 USA and 4 USSR (1947-1954).

Institution : M. V. Lomonosov State University, Moscow

Presented by: Academician N. N. Bogolyubov, January 1, 1955

TOLMACHEV, V.V.

Distribution function with time correlation in the statistical mechanics of classical systems. Dokl.AN SSSR 105 no.3:439-441 N '55. (MLRA 9:3)

1. Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova.
(Statistical mechanics)

TOLMACHEV, V. V.

Transactions of the Third All-union Mathematical Congress, Moscow, Jun-Jul '56, Trudy '56, V. 1, Sect. Rpts., Izdatel'stvo AN SSSR, Moscow, 1956, 237 pp.

Tolmachev, V. V. (Moscow). Distribution Functions With Time Correlation in the Statistical Mechanics of Classic Systems. p.225-226

APPROVED FOR RELEASE: 07/16/2001 CIA-RDP86-00513R001756110012-7"

TOLMACHEV, V.V.

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1390
AUTHOR TOLMACEV, V.V., TJABLIKOV, S.V.
TITLE A Method for the Computation of the Statistical Sums for Ferromagnetica in Consideration of the Restrictions Imposed upon the Filling Numbers of the Spin Waves.
PERIODICAL Dokl.Akad.Nauk, 108, fasc. 6, 1029-1031 (1956)
Issued: 9 / 1956 reviewed: 10 / 1956

The present representation of this method takes into account that the projection of the spin of every atom (in $\hbar$ /2 units) assumes only the two values $\pm$ 1 if one electron corresponds to each atom.
At first the HAMILTONIAN of the ferromagneticum is written down, after which one passes from spin operators to BOSE operators. Also on this occasion one electron is supposed to correspond to each atom. The HAMILTONIAN in this new variable is written down as a sum of three summands $\mathcal{H} = E_0 + \mathcal{H}_1 + \mathcal{H}_2$, and each summand is explicitly given. The equations $\mathcal{H}\phi = E\phi$ for the determination of eigenfunctions and eigenvalues are to be investigated only within the space of the filling-up numbers $n_f = 0,1$. However, in order to simplify further computations, this equation is examined in all spaces of all possible filling-up numbers; the restriction to $n_f = 0,1$ is taken into account by the introduction of an operator $P = \prod_{(f)} \left\{ \Delta(n_f) + \Delta(n_f - 1) \right\}$. Here $\Delta(n) = 1$ and $\Delta n = 0$ is true for n=0 and $n \neq 0$ respectively. This operator P projects

Dokl.Akad.Nauk, 108, fasc. 6, 1029-1031 (1956) CARD 2 / 2 PA - 1390

the functions applying within the space of all possible filling-up functions on to the functions in the space with $n_f = 0,1$.
In zero-th approximation $Z_o = Sp(e^{-\mathcal{H}_o/\Theta})$ is true for the sum of states, on which occasion the trace is extended to the space of the numbers $n_f = 0,1$.
$Z_o = Sp(P \exp[-\mathcal{H}_o/\Theta])$ is true in the space of all possible filling-up numbers. The computation of Z_o is simplified considerably by making use of an orthonormalizing system; the rather complicated expression found is explicitly given. There follows herefrom at low temperatures
$Z_o \approx 1 + \sum_{(v)} e^{-E(v)/\Theta}$.
According to information received from N.N.BOGOLJEBOV similar ideas were already developed by DYSON in manuscripts meanwhile received while the present work was being printed.

INSTITUTION: Mathematical Institute V.A.STEKLOV of the Academy of Science in the USSR

TOLMACHEV, V. V. Cand Phys-Math Sci -- (diss) "Problems of the General Theory of Time Correlation Functions." Mos, 1957. 11 pp 22 cm. (Mos State Univ im M. V. Lomonosov, Physics Faculty), 150 copies (KL, 18-57, 93)

PA - 2250

AUTHOR TOLMACHEV, V.V.

TITLE Time Correlations in the classical statistical System composed of interacting Particles (Vremennyye korrelatsii v klassicheskikh sistemakh, sostoyashchikh iz bolshogo chisla vzaimodeystvuyushchikh chastits).

PERIODICAL Doklady Akademii Nauk SSSR,1957,Vol 112,Nr 5,pp842-845 (U.S.S.R.)
Received 4/1957 Reviewed 5/1957

ABSTRACT The present report brings the results of the application of the method of interlinked distribution functions which gives, from a uniform standpoint, a derivation for the correlation function $\Phi_1(t,x_1\ x_0)$ of the FOKKER-PLANCK-equation for systems with remote effect (systems of the plasma-type) and also a derivation for the equation of systems with short range (real gas).
The present investigation concerns a system of homogeneous classical particles which are pairwise in interaction (with the potential $\Phi(|q|)$ and are contained in a certain macroscopic volume V. The chain-like correlation functions introduced with 1,2... etc. arguments are given and explained. For these correlation-functions $\Phi_s(t,x_1,\dots x_s|x_0)$ a system of equations including the corresponding initial conditions is given. The solution applying in the case of times which are much longer than the times of the free length of path is sought here in a form which time assumes by the functional dependence on the first correlation-functions. The functional equations for the first correlation-functions themselves are given. From these equations cor-

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PA - 2250

Time Correlations in the classical statistical System composed of interacting Particles.

relations between the functionals and the next-higher functionals are obtained. For the purpose of separating a unique solution additional conditions have to be imposed onto the functionals which, from the physical standpoint, mean a decrease of correlation.
For systems with remote effect the functionals required are developed in power series. In the case of a statistical equilibrium an equation of the FOKKER-PLANCK-type can here be obtained in second approximation; it is also written down here, In the case of a pure COULOMB-potential an integral contained in it diverges and this integral has to be cut off as usual. The here obtained results fully agree with those obtained by other authors.
Also for systems with short range an interesting equation is given. The required functionals are then developed as power series according to a small parameter. (No illustrations)

ASSOCIATION Moscow State University
PRESENTED BY N.N.BOGOLYUBOV, member of the Academy, on 19. 9. 1956
SUBMITTED 12. 9. 1956
AVAILABLE Library of Congress

Card 2/2

20-114-6-20/54

AUTHORS: Tyablikov, S. V., Tolmachev, V. V.

TITLE: Distribution Functions for the Classic Electron Gas (Funktsii raspredeleniya dlya klassicheskogo elektronnogo gaza)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 114, Nr 6, pp. 1210-1213 (USSR)

ABSTRACT: According to the author's opinion various methods (mentioned here), in spite of their effectiveness in the calculation of concrete problems, are not suitable for the removal of difficulties in the construction of a radial function in systems with pure Coulomb interaction. It was the object of the present paper to improve the convergence of the development by N. N. Bogolyubov for small intervals. First the system of nonlinear integral equations obtained by N. N. Bogolyubov for Debye's expression G(r) for the radial function is written down. In it the author replaces the unknown functions and in this manner obtains the system

$$V(|q|)=\Phi(|q|)-\bar{\Phi}(|q|)+\frac{1}{v}\int dq_1\left\{e^{-\bar{\Phi}(|q_1|)/\theta}C(|q_1|)-1\right\}.$$

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20-114-6-20/54

Distribution Functions for the Classic Electron Gas

$$\int_{\infty}^{|q-q_1|} dr \frac{d\Phi(r)}{dr} = e^{-\bar{\Phi}(r)/\theta} C(r); \quad C(|q|) = \exp\left\{-\frac{1}{\theta} V(|q|)\right\}.$$

For the solution of this problem the author puts down $\frac{1}{\theta}\Phi(|q|) = v\Psi(|q|)$, $\frac{1}{\theta}\bar{\Phi}(|q|) = v\,\bar{\Psi}(|q|)$. For the determination of V and C the series developments are put down according to exponents of v:

$$C(|q|) = C_0(|q|) + v\,C_1(|q|) + v^2 C_2(|q|) + \dots\dots\dots$$

$$V(|q|) = V_0(|q|) + v\,V_1(|q|) + v^2 V_2(|q|) + \dots\dots\dots$$

The thus obtained equations of zeroth and first approximation and the correction of first approximation are written down. A Coulomb potential with Debye screeing is obtained:

$$\bar{\Phi}(|q|) = \frac{e^2}{|q|} e^{-|q|/r_d}.$$

Then the solution of second approximation equations is written down. In disregard of second and higher approximation corrections the following expression is obtained for the radial function:

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20-114-6-20/54

Distribution Functions for the Classic Electron Gas

$G(r) = \exp\left\{-\frac{e^2}{\theta}\frac{1}{r}e^{-r/r_d}\right\}$. This function can be obtained without ternary approximation. The here discussed considerations might, after several alter_ations, be applied to systems of charged particles with different sign of charge. There are 2 references, 2 of which are Slavic.

ASSSOCIATION: Mathematical Institute imeni V. A. Steklov of the AS USSR (Matematicheskiy institut im. V. A. Steklova Akademii nauk SSSR)

PRESENTED: December 27, 1957, by N. N. Bogolyubov, Member of the Academy

SUBMITTED: December 14, 1956

Card 3/3

TOLMACHEV, V. V.

BOGOLYUBOV, Nikolay Niolayevich; TOLLMACHEV, Vladimir Veniaminovich; SHIRKOV, Dmitriy Vasil'yevich; GUROV, K.P., red.izd-va; POLENOVA, T.P., tekhn.red.

[New method in the theory of superconductivity] Novyi metod v teorii sverkhprovodimosti. Moskva, Izd-vo Akad.nauk SSSR, 1958. 127 p. (MIRA 11:6)
(Superconductivity)

TYABLIKOV, S.V.; TOLMACHEV, V.V.

Classical theory of strong electrolytes. Nauch. dokl. vys. skoly; fiz.-mat. nauki no.1:101-109 '58. (MIRA 12:3)

1. Matematicheskiy institut im. V.A. Steklova.
(Electrolytes)

TOLMACHEV, V. V.

AUTHORS: Tolmachev, V. V., Tyablikov, S. V. 56-1-11/56

TITLE: A New Method in the Theory of Superconductivity. II. (O novom metode v teorii sverkhprovodimosti. II).

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 1, pp. 66-72 (USSR)

ABSTRACT: The present paper shows the equivalence of the Hamiltonians of the systems of Bardin and Fröhlich, and thus estabslishes the superconductivity of the Bardin Hamiltonian obtained in this way. For the calculations the Bogolyubov method is used. It is a characteristic feature of the electronphonon interaction discussed here that it is effective only in a very thin layer on the Fermi level, and considerably decreases when the distance from this level is increased. Therefore the electron transitions on the Fermi level can essentially contribute to all effects. In this case the energy of the electron transitions may be regarded as small compared to the energy $\hbar\omega$ of the phonons. Here a typical adiabatic combination occurs. At the beginning the Hamiltonian of the system investigated here is put down. Next the operator form of the perturbation theory is used. The determination of the

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A New Method in the Theory of Superconductivity. II. 56-1-11/56

eigenfunctions and eigenvalues is reduced to the solution of an equation with a certain "deformed" factor. This equation is put down here in an explicit form with an exactness up to the order of magnitude of g^2 inclusive. The authors here investigate the case of the phonon vacuum. The application of the perturbation theory to the operator used here leads to logarithmical divergences if the distance from the Fermi level is increased. Then a canonical transformation is exercised on the operators. The trivial solution of the system of equations with corresponding calculations corresponds to the normal (not superconducting) state of the system. Then asymptotic terms for the non-trivial solution are given. The energy of the elementary excitations is calculated in the first approximation with respect to g^2. After that the authors prove that the superconducting state is more profitable as to energy than is the normal state. The formulae received here are hardly susceptible to a change of the form of the reciprocal actions assumed here. The results discussed as yet were received in the first perturbation theory approximation. But the compensation of the diagrams of the

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A New Method in the Theory of Superconductivity. II. 56-1-11/56

second degree (g^4) does not change the results. There are 2 figures, and 5 references, 2 of which are Slavic.

ASSOCIATION: Mathematical Institute of the AN USSR (Matematicheskiy institut Akademii nauk SSSR).

SUBMITTED: October 17, 1957

AVAILABLE: Library of Congress

Card 3/3

AUTHORS: Tyablikov, S. V., Tolmachev, V. V. SOV/56-34-5-29/61

TITLE: Electron Interaction With Lattice Vibrations (O vzäimodeystvii elektronov s kolebaniyami reshetki)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 5, pp. 1254 - 1257 (USSR)

ABSTRACT: The authors investigate the problem of the stability taking into consideration the interaction of the electrons with the phonon field. The authors start from the following Hamiltonian for the interaction of the electrons with the lattice vibrations

$$H = H_o + H_{int}, \quad H_o = \sum_{k,\sigma} \mathcal{E}(k) a^+_{k\sigma} a_{k\sigma} + \sum_q \hbar\omega(q) b^+_q b_q$$

$$H_{int} = \frac{g}{\sqrt{2V}} \sum_{k,k',\sigma} \sqrt{\hbar\omega(k'-k)} \left(a^+_{k'\sigma} a_{k\sigma} b_{k'-k} + a^+_{k\sigma} a_{k'\sigma} b^+_{k'-k}\right)$$

$a^+_{k\sigma}$, $a_{k\sigma}$, and b^+_k, b_k respectively denote the creation- and annihilation operators of the electrons and the phonons re-

Card 1/3

spectively, and F denotes the volume of the domain of the main periodicity. The authors are interested in phonons with sufficiently low energies, where $\hbar\omega \ll \Delta\varepsilon$ denotes the mean difference of the energies in the electron transitions. By means of the so-called adiabatic approximation in the form given by Bogolyubov and Tyablikov (Refs 2, 3) a good conception concerning the phenomena connected with this process can be obtained. The Hamiltonian mentioned above is transformed to a subspace of states every one of which is, with regard to the electrons, a Fermi vacuum. The solution of the resulting equation is not difficult. The corresponding secular equations are written down. The Hamiltonian mentioned above does not contain any Coulomb (Kulon) interaction. If the Coulomb (Kulon) interaction is inserted the criterion for the stability of the crystal lattice will be different. The conclusion, however, that the lattice is unstable in the case of sufficiently high binding constants probably remains valid. Subsequently it is shown that the criterion for the stability of the lattice can be obtained easily by applying the principle of the compensation of the "dangerous diagrams".

Electron Interaction With Lattice Vibrations SOV/[illegible] 34-5-29/6

There are 4 references, 3 of which are Soviet

ASSOCIATION: Matematicheskiy institut Akademii nauk SSSR (Mathematics Institute, AS USSR)

SUBMITTED: December 10, 1957

1. Crystals--Vibration 2. Crystals--Lattices 3. Particles --Properties 4. Mathematics--Applications

Card 3/3

AUTHORS: Tolmachev, V. V., Tyablikov, S. V. 20-119-2-35/60

TITLE: On the Classical Theory of Strong Electrolytes (K klassicheskoy teorii sil'nykh elektrolitov)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 119, Nr 2, pp. 314 - 317 (USSR)

ABSTRACT: The main aim of the theory of strong electrolytes is the calculation of the correction ΔF for the free energy deriving from the interaction of the ions. A considerable step forward in this field was made by Debye (Debaye), who correctly took into account the electrostatic interaction of the ions. First various expressions for ΔF found by Debye(Debaye), E. Hückel (Gyukkel')(Reference 1) and N. Bjerrum (Reference 2) are put down. The present paper deals with the problem of the static reasoning of the just mentioned corrections by means of correlation functions by N.N Bogolyubov. The system of the equations for the correlations functions and an approach to a solution belonging to it are put down. The course of calculation is followed step by step and the obtained expression for ΔF is mentioned.

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On the Classical Theory of Strong Electrolytes 20-119-2-35/60

Then the author shows the following: in this expression for $\triangle F$ the Bjerrum correction is contained (at least for small concentrations of ion pairs of different signs which are close to eachother. For reasons of simplicity the author investigates the special case of the electrolytes with two types of ions with the same absolute values of charge. In this case the above-mentioned formula for $\triangle F$ can be simplified. An exact comparison of the here found formula for $\triangle F$ with the corresponding expression of the Bjerrum theory will be possible only after the numerical calculation of the integrals. According to the authors the here found results explain sufficiently the basic trends of the Bjerrum theory. The authors thank N. N. Bogolyubov, Member of the Academy, for the discussion on this work. There are 8 references, 4 of which are Soviet.

ASSOCIATION: Matematicheskiy institut im. V. A. Steklova Akademii nauk SSSR(Mathematical Institute imeni V. A. Steklov, AS USSR)

Card 2/2

SOV/20-120-2-13/63

AUTHORS: Kvasnikov, I. A., Tolmachev, V. V.

TITLE: On a Variation Principle in the Statistical Many-Body Problem (Ob odnom variatsionnom printsipe v statisticheskoy zadache mnogikh tel)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 120, Nr 2, pp. 273-276 (USSR)

ABSTRACT: In a previous paper N. N. Bogolyubov discussed the dynamic system of Fermi particles with pair interaction and he proposed using a new approximate variation method for the many-body problem. This method is a generalization of the well-known Fock method. It is interesting to formulate a statistical variation principle that may be applied to the determination of thermodynamic quantities at zero and non-zero temperatures. This paper endeavors to carry out this program. The authors investigate a system of Fermi particles with the Hamiltonian $H = \sum \left\{ T(f,f') - \lambda\delta_{f,f'} \right\} a^+_f a_{f'} + \frac{1}{2} \sum J(f_1, f_2; f'_2, f'_1) a^+_{f_1} a^+_{f_2} a_{f'_2} a_{f'_2}$

λ denotes the chemical potential, f- the set of the indices which define the state of one particle. With respect to J one may write $J(F_1, f_2; f'_2, f'_1) = -J(f_1, f_2; f'_1, f'_2) = -J(f_2, f_1; f'_2, f'_1)$

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On a Variation Principle in the Statistical Many-Body Problem

SOV/20-120-2-13/63

The author then introduces new Fermi amplitudes by means of a canonical transformation $a_f = \sum_{\nu}(u_{f\nu}\alpha_\nu + v_{f\nu}\alpha^+_\nu)$. The coefficient functions u, v play the role of variation parameters. It is not sufficient to give one "test vacuum state", but it is necessary to know also the "test excitations." This is realized by choosing the following zero Hamiltonian $H = U + H_0 + H_1$ with $U = \langle C_0^* H C_0 \rangle$, $H_0 = \sum_\mu E_\mu \alpha^+_\mu \alpha_\mu$. E_μ denotes the difference between the energies of the excited state and the vacuum state C_0. Next, N. N. Bogolyubov's variation theorem is applied to the above mentioned variation principle. This variation theorem gives an estimation of the upper limit of the thermodynamic potential: $\Omega = -\theta \ln Sp e^{-H/\theta}$. The variation principle formulated in this paper gives the exact solution of a whole class of problems with a quadruple Hamiltonian. As an other example, the authors investigate more exactly the application of the statistical variation method to a system, the Hamiltonian of which contains only the interaction of particle pairs with antiparallel momenta. With this statistical variation principle the authors determine the critical temperature where the nuclear matter becomes liquid. At least the problem of the "stability" of the "normal" state of the

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system is investigated. There are 4 Soviet references.

ASSOCIATION: Matematicheskiy institut im. V. A. Steklova Akademii nauk SSSR (Mathematics Institute imeni V. A. Steklov AS USSR)

PRESENTED: January 17, 1958, by N. N. Bogolyubov, Member, Academy of Sciences, USSR

SUBMITTED: January 15, 1958

1. Particles--Mathematical analysis 2. Thermodynamics --Mathematical analysis 3. Particles--Stability

TOLMACHEV, V. V.

A new method in the theory of superconductivity, by N. N. Bogoliubov, V. V. Tolmachev, and D. V. Shirkov, New York, Consultants Bureau; London, Chapman & Hall, 1959.

121 P. Diagrs.

Translated from the original Russian title: Novyy metod v teorii sverkhprovodimosti. Moskva, 1958.

V. V. Tolmachev

24(0) SOV/53-67-4-7/7

AUTHOR: Chentsov, R.

TITLE: The Fifth All-Union Conference on the Physics of Low Temperatures (5-ye Vsesoyuznoye soveshchaniye po fizike nizkikh temperatur)

PERIODICAL: Uspekhi fizicheskikh nauk, 1959, Vol 67, Nr 4, pp 743-750 (USSR)

ABSTRACT: This Conference took place from October 27 to November 1 at Tbilisi; it was organized by the Otdeleniye fiziko-matematicheskikh nauk Akademii nauk SSSR (Department of Physico-mathematical Sciences of the Academy of Sciences, USSR), the Akademiya nauk Gruzinskoy SSR (Academy of Sciences, Gruzinskaya SSR), and the Tbilisskiy gosudarstvennyy universitet im. Stalina (Tbilisi State University imeni Stalin). The Conference was attended by about 300 specialists from Tbilisi, Moscow, Khar'kov, Kiyev, Leningrad, Sverdlovsk, and other cities as well as by a number of young Chinese scientists at present working in the USSR. About 50 lectures were delivered which were divided according to research fields.

II. Supraconductivity. 13 lectures were delivered on this field of which two were experimental and the others theoretical. Reports on experimental investigations of supraconductivity were delivered by Yu. V. Sharvin and V. P. Gantmakher (IFP) and N. V. Zavaritskiy (IFP). The former investigated the structure of the intermediate state in monocrystals of pure tin, the latter measured the thermal conductivity of differently shaped orientated cylindrical gallium samples at 0.1 - 4.2°K. A. A. Abrikosov, L. P. Gor'kov and I. M. Khalatnikov (IFP) theoretically investigated the behavior of a superconductor in the high-frequency field. V. L. Ginzburg and G. F. Zharkov (FIAN) dealt with the microscopical theory, and Ginzburg discussed among other things the part played by fluctuations in phase transitions of the second kind. I. M. Lifshits (KhFTI) showed that it follows from the modern theory of supraconductivity in consideration of the anisotropy of metals that, in principle, the existence of supraconductors is possible which are supra-conductive only within a limited range of temperature (and not at all temperatures below the critical ones). B. T. Geylikman and V. Z. Kresin (IAE) investigated the electron- and phonon thermal conductivity of supraconductors by means of the microscopical theory at temperatures that are not very near absolute zero. M. V. Buykov and L. E. Gurevich (FTI AN SSSR) spoke about the surface energy on the boundary between the supraconductive and normal phases. D. N. Zubarev and Yu. A Tserkovnikov (Matematicheskiy institut AN SSSR = Mathematics Institute AS USSR) dealt with the thermodynamics of the supraconductive state (Froehlich-model), V. V. Tolmachev (MIAN) investigated the problem of collective excitations in a supraconductor. D. V. Shirkov (Ob"yedinennyy institut yadernykh issledovaniy - Joint Institute of Nuclear Research) spoke about consideration of Coulomb-interaction of electrons in semiconductors. The problem of consideration of the Coulomb interaction was discussed by Chen' Ch'un-hsien and Chou, Hsi-hsin ' (MGU).

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S/020/60/134/006/009/031
B019/B067

AUTHOR: Tolmachev, V. V.

TITLE: The Relationship Between the Statistical Variational Principle and the Method of Partial Summation of Diagrams of the Thermodynamic Perturbation Theory in the Modified Formulation of the Problem of a Non-ideal Bose-Einstein System

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 6, pp. 1324 - 1327

TEXT: The modified formulation of the problem of a non-ideal Bose-Einstein system differs from the ordinary one in that its production and annihilation operators a_o^+ and a_o of the zero-momentum particles can be replaced. The author writes down the Hamiltonian (1) and the operator of the total number of particles in the second quantization representation $\mathcal{N} = N_o + \sum_p a^+_{-p} a_p$ (2). Here, N_o is the number of particles in the condensate.

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The Relationship Between the Statistical Variational Principle and the Method of Partial Summation of Diagrams of the Thermodynamic Perturbation Theory in the Modified Formulation of the Problem of a Non-ideal Bose-Einstein System

S/020/60/134/006/009/031
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According to (3), the thermodynamic potential F can be regarded as a function of the independent variables N_o and μ, where μ is the chemical potential. By a canonical Bogolyubov transformation of the Bose operators a_p^+ and a_p into the new Bose operators b_p^+ and b_p: $a_p = u_p b_p + v_p b_{-p}^+$, and using the statistical variational principle the author obtains expressions (8) and (9) for the chemical potential and the mean total number of the particles of the system. In the following, the author passes over to the relationship between the statistical variational principle and the partial summation of the diagrams of the formal perturbation theory. First, it is shown how the diagrams sum up the variational principle, the diagrams being treated for the Green single-particle temperature function. Rules are set up for constructing the diagram. Next, it is shown how the pair vertices and the self-energy parts of first order can be eliminated. This indicates that the statistical variational principle and the summation of a special class of temperature diagrams are equivalent. Similar results are obtained for a non-ideal Fermi-Dirac system. There are 2 figures and

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The Relationship Between the Statistical Variational Principle and the Method of Partial Summation of Diagrams of the Thermodynamic Perturbation Theory in the Modified Formulation of the Problem of a Non-ideal Bose-Einstein System

S/020/60/134/006/009/031
B019/B067

7 references: 3 Soviet and 4 US.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

PRESENTED: June 10, 1960, by N. N. Bogolyubov, Academician

SUBMITTED: June 7, 1960

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TOLMACHEV, V. V.

"The perturbation theory for Bose Gases."

report submitted for the Intl. Congerence on Many-Body Problems, IUPAP, Utrecht, Netherlands., 13-18 June 1960.

Mathematical Inst im V. A. Steklov, Moscow.

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S/020/60/135/004/016/037
B019/B077

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AUTHOR: Tolmachev, V. V.

TITLE: Elementary Thermal Excitation in a Non-ideal Bose-Einstein System

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 4, pp. 825-828

TEXT: In the present investigation, the author used a formulation in which the density operator ϱ_q splits into two components:

$$\varrho_q^o = \sqrt{N_o}(a_q + a_{-q}^+),\ \varrho_q' = \sum_p a_p^+ a_{p+q} \qquad (1).$$

Then, the Green temperature functions:

$$D(q;t-t') = \frac{i}{\hbar}\left\langle T(\varrho_q^o(t)\varrho_{-q}^o(t'))\right\rangle$$
$$Q(q;t-t') = \frac{i}{\hbar}\left\langle T(\varrho_q'(t)\varrho_{-q}'(t'))\right\rangle \qquad (2)$$

are investigated, and their poles yield the elementary thermal excitation. The author obtains: $\varrho_q^o(t) = e^{i\Omega t/\hbar}\varrho_q^o e^{-i\Omega t/\hbar}$, $\varrho_q'(t) = e^{i\Omega t/\hbar}\varrho_q' e^{-i\Omega t/\hbar}$

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Elementary Thermal Excitation in a Non-ideal Bose-Einstein System

S/020/60/135/004/016/037
B019/B077

$\langle \cdots\cdots \rangle = \mathrm{Sp}\, e^{-\beta\Omega} \ldots | \mathrm{Sp}\, e^{-\beta\Omega}$, with $\beta = 1/\Theta$. $\Theta = kT$. In the following the author uses his previous papers (Refs. 1, 2), studies of Du Bois (Ref. 3) and N. N. Bogolyubov et al. (Ref. 4). He deals with the finding of the main part of Ω applying a canonical Bogolyubov transformation, and finds a representation of the propagator for the individual excitations and of the propagator for the non-coupled pairs due to these excitations. Taking collective and individual excitations into account the author obtains the following secular equation:

$$1 - \frac{\nu^2(q)}{V^2} D_o(q;E) \frac{Q_o(q;E)}{1 + \frac{\nu(q)}{V} Q_o(q;E)} = 0 \qquad (8).$$

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The character of the temperature dependence of the spectrum of individual excitations is studied with the use of formulas found in previous studies by the author. Expressions for the gap of individual excitation energies are obtained, and it is shown that the spectrum of elementary excitations has no gaps. A secular equation is obtained for this excitation, and the effect of the canonical transformation at the transition from the sum to the integral is neglected. It is assumed that $E = s|q|$, and the passage
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Elementary Thermal Excitation in a Non-ideal Bose-Einstein System

S/020/60/135/004/016/037
B019/B077

to the limit $q \longrightarrow 0$ yields an asymptotic relation for s:

$$s^2 = \frac{\hbar^2}{m} n\nu(0).$$

The scheme suggested by the author has to be improved for the case of singular interaction potentials of the type of interactions of solid spheres. There are 8 references: 3 Soviet, 2 US, and 1 Dutch.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

PRESENTED: June 17, 1960, by N. N. Bogolyubov , Academician

SUBMITTED: June 11, 1960

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TOLMACHEV, V.V.

Elementary excitations by temperature in a nonideal Bose-Einstein system. Dokl. AN SSSR 135 no.4:825-828 '60. (MIRA 13:11)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova. Predstavleno akademikom N.N.Bogolyubovym.
(Quantum statistics)

S/020/60/135/001/010/030
B006/B056

AUTHOR: Tolmachev, V. V.

TITLE: The Construction of Expansions Which Are Asymptotic in the Case of Weak Interaction From the Formal Thermodynamic Perturbation Theory in the Modified Problem of a Non-perfect Bose-Einstein System

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 1, pp. 41-44

TEXT: In the introduction the author raises the question, to what approximation the summation of a special kind of graphs occurring in the statistical variation principle, corresponds. He is of the opinion that the main advantage offered by this kind of summation consists in the fact that with their help it is possible to construct an expansion that is asymptotic in the case of weak interaction. The author deals with the first approximation, which corresponds to the consideration of the two diagrams and o-----o of first order. For this purpose, a system of non-linear integral equations must be solved. He then proceeds to deal with the second approximation, and determines the contribution made by

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The Construction of Expansions Which Are Asymptotic in the Case of Weak Interaction From the Formal Thermodynamic Perturbation Theory in the Modified Problem of a Non-perfect Bose-Einstein System

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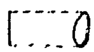
B006/B056

the diagram  , which is the most important in second order (which leads to terms which are logarithmic with respect to interaction). Finally, the possible generalization of the results obtained is discussed in two directions. There are 6 references: 1 Soviet and 5 US.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Institute of Physics and Chemistry imeni L. Ya. Karpov)

PRESENTED: June 10, 1960, by N. N. Bogolyubov, Academician

SUBMITTED: June 7, 1960

Card 2/2

TOLMACHEV, V.V.

Building of asymptotic expansions for weak interactions on the basis of the formal thermodynamic perturbation theory in a modified statement of the problem of the Bose-Einstein nonideal system. Dokl. AN SSSR 135 no.1:41-44 N '60. (MIRA 13:11)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova. Predstavleno akademikom N.N.Bogolyubovym.
(Mathematical physics)

28730
S/020/61/140/003/009/020
B104/B125

24.2140

AUTHOR: Tolmachev, V. V.

TITLE: Logarithmic criterion of superconductivity

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 140, no. 3, 1961, 563-566

TEXT: N. N. Bogolyubov and the author analyzed the effects of Coulomb interaction upon superconductivity (N. N. Bogolyubov et al., Novyy metod v teorii sverkhprovodimosti (New method in the theory of superconductivity), Izd. AN SSSR, 1958). They showed that the criterion $\rho_{ph} - \rho_c > 0$ suggested by J. Bardeen et al. (Phys. Rev., 108, 1175 (1957)) for superconductivity can be replaced by the more exact criterion $\rho_{ph} - \rho_c(1 - \rho_c \ln(\omega_{ph}/\omega_c))^{-1} > 0$. The parameters ρ_{ph} and ρ_c characterize the interaction between electrons caused by phonons and also the Coulomb electron-electron interaction; ω_{ph} and ω_c are related to the energy-cutoff of these interactions at a great distance from the Fermi surface. Damping effects that were neglected in the previous papers mentioned above are taken into account in the present work.

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Logarithmic criterion of superconductivity

The investigation was based on a new formulation of the Feynman graph technique by N. N. Bogolyubov (Physics, 26, Suppl., Congress on Many Particle Problems, Utrecht, 1960). An asymptotic equation for superconductivity is derived. It is suited for a complete study of the effects of superconductivity and it makes possible to study the effects of Coulomb interaction, the delay effects of electron-phonon interaction, and the damping effects. The criterion of superconductivity is formulated with this equation. $\rho = \rho_{ph} - \rho_c\left(1 - \rho_c \ln(\omega_{ph}/\omega_c)\right)^{-1}$ is obtained, from which the logarithmic criterion of superconductivity follows directly. In it, ω_c is determined by the damping of electron excitation far away from the Fermi surface. Mention is made of a lecture delivered by J. Bardeen on September 14, 1960 at the Institut fizicheskikh problem (Institute of Physical Problems) in a seminar presided by P. L. Kapitsa. S. T. Belyayev and L. P. Gor'kov are mentioned. N. N. Bogolyubov is thanked for valuable advice. There are 5 references: 4 Soviet and 1 non-Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

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28730
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B104/B125

Logarithmic criterion of superconductivity

PRESENTED: March 8, 1961, by N. N. Bogolyubov, Academician

SUBMITTED: March 1, 1961

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TOLMACHEV, V.V.

Logarithmic criterion of superconductivity. Dokl. AN SSSR 140 no.3:563-566 S '61. (MIRA 14:9)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova. Predstvaleno akademikom N.N.Bogolyubovym.
(Superconductivity)

TOLMACHEV, V.V.

Shift of the branching point of the mass operator in the formal theory of perturbations for a nonideal Fermi-Dirac system. (MIRA 14:11)
Dokl. AN SSSR 141 no.4:829-832 D '61.

1. Fiziko-khimicheskiy institut im. L.Ya. Karpova. Predstavleno akademikom N.N. Bogolyubovym.
(Fermi surfaces) (Operators (Mathematics))

TOLMACHEV, V.V.

Diverging diagrams in the formal theory of perturbations for a nonideal Fermi-Dirac system and their mutual compensation. Dokl. AN SSSR 141 no.3:582-585 N '61. (MIRA 14:11)

1. Fiziko-khimicheskiy institut im. L.Ya. Karpova. Predstavleno akademikom N.N. Bogolyubovym.
(Fermi surfaces)

35346
S/054/62/000/001/002/011
B102/B112

24.4400

AUTHOR: Tolmachev, V. V.

TITLE: The Hartree-Fock method as a method of partial summation of graphs and its natural generalization

PERIODICAL: Leningrad. Universitet. Vestnik. Seriya fiziki i khimii, no. 1, 1962, 11 - 19

TEXT: The aim of the author was to find a relationship between the Hartree-Fock method and the partial summation of a certain graph and, by passing over to the summation of a broader class of graphs, to obtain a generalization of the Hartree-Fock method as an approximation. The Hamiltonian of the system considered is given in second-quantization representation, and a perturbation-theoretical expansion of the temperature S-matrix is introduced for it:

$$S=\sum_{n=0}^{\infty}\frac{(-1)^n}{n!}\int_0^{\beta}d\tau_1\ldots\int_0^{\beta}d\tau_n T(H_{\text{int}}(\tau_1)\ldots H_{\text{int}}(\tau_n)), \quad (4)$$

$$H_{\text{int}}(\tau)=\frac{1}{2}\sum_{ijkl}v_{ij,kl}\overset{+}{a}_i(\tau+0)\overset{+}{a}_j(\tau+0)a_k(\tau)a_l(\tau). \quad (5)$$

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The Hartree-Fock method as a ...

With $a_i(\varepsilon) = e^{-(E_i-\mu)\tau} a_i$, $\overset{+}{a}_i(\tau) = e^{(E_i-\mu)\tau}\overset{+}{a}_i$ (annihilation and creation operators), and $\langle .....\rangle = Sp e^{-\beta(H_0-\mu N)} ..../Sp e^{-\beta(H_0-\mu N)}$, the single-particle Green function $G_{mm'}(\xi,\xi') = \langle T(a_m(\xi)\overset{+}{a}_{m'}(\xi')S)\rangle/\langle S\rangle$ can be introduced in interaction representation. It is related to the system considered by

$$G_{mm'}(\xi,\xi') = G^0_{mm'}(\xi,\xi') + \qquad (10)$$

$$+\int_0^\beta d\tau \sum_{ijkl} v_{ij,kl} G^0_{mi}(\xi, \tau+0)\, G_{lk,jm'}(\tau\tau, \tau+0, \xi'), \qquad (11)$$

when $G^0_{mm'}(\xi,\xi') = e^{-(E_m-\mu)(\xi-\xi')}[(1-n_m)\,\theta(\xi-\xi') - n_m\theta(\xi'-\xi)]\,\delta_{mm'}$,

is introduced. $\delta_{mm'}$ is the Kronecker symbol, and $n_m = 1/(e^{\beta(E_m-\mu)}+1)$.

With the two-particle Green function (13),

$$G^0_{mn,n'm'}(\xi\eta;\eta'\xi') = G^0_{mm'}(\xi,\xi')\,G^0_{nn'}(\eta,\eta') - G^0_{mn'}(\xi,\eta')\,G^0_{nm'}(\eta,\xi').$$

thus

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$$G_{mm'}(\xi, \xi') = G^0_{m'}(\xi, \xi')\delta_{m,m'} + \\ + \int_0^\beta d\tau \sum_k v_{mk,km'} G^0_m(\xi, \tau) G^0_{m'}(\tau, \xi') G^0_k(\tau, \tau+0) - \\ - \int_0^\beta d\tau \sum_k v_{mk,m'k} G^0_m(\xi, \tau) G^0_k(\tau, \tau+0) G^0_{m'}(\tau, \xi') + \dots \tag{14}$$

is valid in zeroth approximation. These relations are used to obtain

$$G'_{mm'}(\xi, \xi') = G^0_{m'}(\xi, \xi')\delta_{m',m} + \\ + \int_0^\beta d\tau \sum_{ljk} (v_{lj,km'} - v_{lj,m'k}) G_{m,l}(\xi, \tau) G_{k,j}(\tau, \tau+0) G^0_{m'}(\tau, \xi'). \tag{15}$$

for the summation of graphs of first order (Fig. 4) and

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$$G_{mm'}(\xi, \xi') = G^0_{m'}(\xi, \xi')\,\delta_{m'm} +$$
$$+ \int_0^\beta d\tau \sum_{ijk} (v_{ij,km'} - v_{ij,m'k})\, G_{m,i}(\xi, \tau)\, G_{k,j}(\tau, \tau+0)\, G^0_{m'}(\tau, \xi') +$$
$$+ \sum_{ijul} \sum_{i'j'l'} \int_0^\beta d\tau \int_0^\beta d\tau' v_{i'j',m'l'}(v_{ij,lk} - v_{ij,kl}) \times \qquad (16),$$
$$\times G_{m,j}(\xi, \tau)\, G_{h,j'}(\tau, \tau')\, G_{l,l'}(\tau, \tau')\, G_{l',i}(\tau', \tau)\, G^0_{m'}(\tau', \xi').$$

which is a natural generalization of (15), for the summation of a broader class including first- and second-order graphs (Fig. 5). As (15) is equivalent to the Hartree-Fock method, (16) can be regarded as a natural generalization of the Hartree-Fock method. Now, (15) is somewhat modified, and its solution is sought as

$$G_{mm'}(\xi, \xi') = \sum_s c_{ms} c^*_{m's} e^{(\varepsilon_s - \mu)(\xi - \xi')} \{(1 - \nu_s)\,\theta(\xi - \xi') - \nu_s \theta(\xi' - \xi)\}, \qquad (19).$$

The new relation

$$(\varepsilon_s - E_m)\, c^*_{ms} = \sum_{ljks'} (v_{lj,km} - v_{lj,mk})\, c_{ks'} c^*_{js'} c^*_{ls} \nu_s. \qquad (28)$$

coincides with the usual Hartree-Fock equation at zero temperatures. (28) is termed a "temperature version" of the Hartree-Fock equation.
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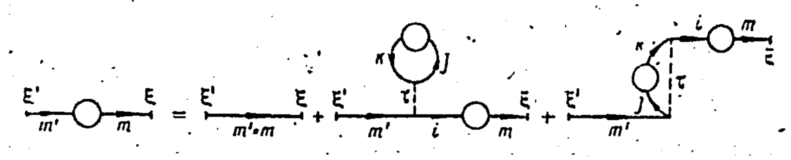
Academician N. N. Bogolyubov is thanked for discusssions. There are 5 figures and 2 non-Soviet references. The two references to English-language publications read as follows: J. Goldstone. Proc. Roy. Soc. 239, No. 1217, 267, 1957; A. Klein and R. Prange. Phys. Rev. 112, 994, 1958.

SUBMITTED: June 20, 1961

Fig. 4



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AUTHOR: Tolmachev, V. V.

TITLE: The problem of coupled two-particle states for a non-ideal Fermi-Dirac system

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 144, no. 5, 1962, 1015-1018

TEXT: An exact system of equations,

$$\frac{i}{\hbar}\frac{\partial G(p_1E_1)}{\partial E_1} = G^2(p_1E_1) - G(p_1E_1)\frac{i}{\hbar}\frac{1}{V}\sum_{p}\frac{1}{2\pi\hbar}\int_{-\infty}^{+\infty} d\mathcal{E}\, G(P - p_1, \mathcal{E} - E_1) \times$$
$$\times \frac{1}{V}\sum_{p''}\frac{1}{2\pi\hbar}\int_{-\infty}^{+\infty} dE'' I(P/2 - p_1, \mathcal{E}/2 - E_1;\ p''E'';\ P\mathcal{E}) \times$$
$$\times G(p''E'';\ P/2 - p_1, \mathcal{E}/2 - E_1;\ P\mathcal{E}); \quad (6)$$

(6) and

$$G(pE:\ p'E';\ P\mathcal{E}) = G(P/2 - p, \mathcal{E}/2 - E)\, G(P/2 + p, \mathcal{E}/2 - E)\, 2\pi\hbar V \times$$
$$\times (\delta(E - E')\Delta(p - p') - \delta(E + E')\Delta(p + p')) -$$

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$$-\frac{i}{\hbar}\frac{1}{V}\sum_{p''}\frac{1}{2\pi\hbar}\int_{-\infty}^{+\infty} dE'' G(P/2-p, \mathcal{E}/2-E)\, G(P/2+p, \mathcal{E}/2+E)\times$$
$$\times I(pE;\ p''E'';\ P\mathcal{E})\, G(p''E'';\ p'E';\ P\mathcal{E}). \qquad (7),$$

is derived in order to investigate a non-ideal Fermi-Dirac system with coupled two-particle (particle-particle or hole-hole) states. The particle-hole state is described by the system of equations

$$G(p_1t_1,\ p_2t_2;\ p_1't_1',\ p_2't_2') =$$
$$= G(p_1t_1;\ p_1't_1')\, G(p_2t_2;\ p_2't_2') - G(p_1t_1;\ p_2't_2')\, G(p_2t_2;\ p_1't_1') +$$
$$+\frac{i}{\hbar}\frac{1}{V}\int_{-\infty}^{+\infty} dt_1'''\sum_{p_1'''}\int_{-\infty}^{+\infty} dt_2'''\sum_{p_2'''}\int_{-\infty}^{+\infty} dt_1''\sum_{p_1''}\int_{-\infty}^{+\infty} dt_2''\sum_{p_2''} G(p_1t_1;\ p_1''t_1'')\, G(p_1'''t_1''';\ p_1't_1')\ \times$$
$$\times J(p_1''t_1'',\ p_2''t_2'',\ p_1'''t_1''',\ p_2''t_2'')\,(G(p_2't_2',\ p_2t_2;\ p_2'''t_2''',\ p_2't_2') -$$
$$- G(p_2''t_2'';\ p_2'''t_2''')\, G(p_2t_2;\ p_2't_2')) \qquad (8) \text{ and}$$

$$G(p_1t_1;\ p_1't_1')\,(-\theta(t_1-t_2)\,\theta(t_2-t_1') + \theta(t_1'-t_2)\,\theta(t_2-t_1)) =$$
$$= -\sum_{p_2} G(p_1t_1;\ p_2t_2)\, G(p_2t_2;\ p_1't_1') +$$

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$$+\frac{i}{h}\frac{1}{V}\int_{-\infty}^{+\infty} dt_1''' \sum_{p_1'''} \int_{-\infty}^{+\infty} dt_2''' \sum_{p_2'''} \int_{-\infty}^{+\infty} dt_1'' \sum_{p_1''} \int_{-\infty}^{+\infty} dt_2'' \sum_{p_2''} \sum_{p_2} G(p_1 t_1; p_1'' t_1'')\, G(p_1''' t_1'''; p_1' t_1') \times$$

$$\times J(p_1'' t_1'', p_2''' t_2'''; p_1''' t_1'''; p_2'' t_2'')\, G(p_2'' t_2''; p_2''' t_2''') \times$$

$$\times(-\theta(t_2'' - t_2)\,\theta(t_2 - t_2''') + \theta(t_2''' - t_2)\,\theta(t_2 - t_2'')). \qquad (9).$$

Eq. (6) contains a derivative with respect to the energy variable. The total Hamiltonian of the system commutes with the operator of the total number N of particles in the system (theorem of conservation of the total number of particles). The system lies in a volume V. Schwinger's interaction operator is denoted by I. Eqs. (6) and (7) are suggested as a basis for the modern microscopic theory of superconduction and for Bruckner's theory of nuclear matter. The equations which were derived by assuming spatial translation invariance for the problem and are given in energy representation form the basis of the modern theory of plasma. Academician N. N. Bogolyubov is thanked for discussions. The most important English-language reference is: A. Klein, R. Prange, Phys. Rev., 112, 994,

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S/020/62/144/005/003/017
The problem of coupled two-particle states ... B125/B104

1008 (1958).

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute imeni L. Ya. Karpov)

PRESENTED: January 29, 1962, by N. N. Bogolyubov, Academician

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Card 4/4

TOLMACHEV, V.V.

Hartree - Fock method as applied to the partial summation of diagrams, and its natural generalization. Vest. LGU 17 no.4:11-19 '62. (MIRA 15:3)

(Quantum field theory)

S/020/62/147/001/013/022
B104/B102

AUTHOR: Tolmachev, V. V.

TITLE: The system of field equations for a non-ideal Fermi-Dirac system explicitly taking the two-particle bound states into account

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 147, no. 1, 1962, 84 - 87

TEXT: In a previous paper V. V. Tolmachev (DAN, 144, no. 5 (1962))* formulated two systems of field equations for two types of two-particle bound states (particle-particle, hole-hole, and particle-hole) which are generalizations of the Bethe-Salpeter equations. Since these equations require that the two interaction operators I and J be known, the mutual influence of the bound states cannot be studied. As the procedure using two systems of equations for the two types of bound states proved inapplicable, a single system of equations is now formulated with a single known interaction operator T, in which the interaction operators I and J are unknown functions. The extensive system of exact field equations so obtained can be regarded as a generalization of the Schwinger system

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(Proc. Nat. Acad. Sci. USA, 37, 452, 455 (1951)); the unknowns are G, I, J and S, where S and G are defined by

$$G(p_1E_1, p_2E_2; p_1'E_1', p_2'E_2') = 2\pi\hbar\delta(E_1+E_2-E_1'-E_2') \times \Delta(p_1+p_2-p_1'-p_2')\, G(p_1E_1)\, G(p_2E_2)\, \{2\pi\hbar\delta(E_1-E_1')\,\Delta(p_1-p_1') - 2\pi\hbar\delta(E_1-E_2')\,\Delta(p_1-p_2')\} + G(p_1E_1)\, G(p_2E_2)\, S(p_1E_1, p_2E_2; p_1'E_1', p_2'E_2')\, G(p_1'E_1')\, G(p_2'E_2'). \quad (1)$$

$$G(p_1E_1, p_2E_2; p_1'E_1', p_2'E_2') = 2\pi\hbar\delta(E_1+E_2-E_1'-E_2')\,\Delta(p_1+p_2-p_1'-p_2')\,\frac{1}{V}\, G(p_1-p_1', p_1-p_2', p_1+p_2; E_1-E_1', E_1-E_2', E_1+E_2), \quad (2)$$

$$S(p_1E_1, p_2E_2; p_1E_1, p_2'E_2') = 2\pi\hbar\delta(E_1+E_2-E_1'-E_2')\,\Delta(p_1+p_2-p_1'-p_2')\,\frac{1}{V}\, S(p_1-p_1', p_1-p_2', p_1+p_2; E_1-E_1', E_1-E_2', E_1+E_2). \quad (3)$$

The interaction graphs can be reduced to three types (Fig. 1). It is stated but not proved that no graphs exist that can be reduced simultaneously to two of the three types shown in Fig. 1. There is 1 figure.

The system of field equations... S/020/62/147/001/013/022
B104/B102

PRESENTED: May 29, 1962, by N. N. Bogolyubov, Academician

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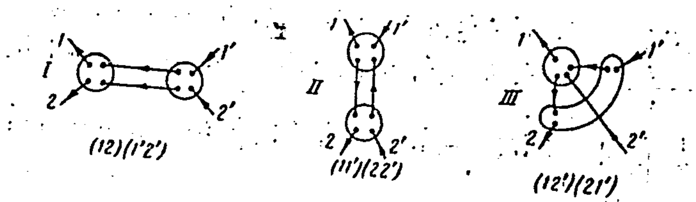
Fig. 1



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41737
S/020/62/146/006/007/016
B104/B186

24.9000

AUTHOR: Tolmachev, V. V.

TITLE: The criterion of superconductivity considered as a criterion for the occurrence of an instability in the Salpeter-Bethe twonucleon equation for the normal state

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 146, no. 6, 1962, 1312-1315

TEXT: In a previous study (V. V. Tolmachev, DAN, 140, 563 (1961)) the criterion of superconductivity was established as furnishing a condition for the Green's single-particle function of normal state, and as Schwinger interaction operator. This criterion was approached from the aspect of superconducting state. In the present case the same criterion is derived from the aspect of normal state by studying the singular instability of the Salpeter-Bethe equation for normal state (L. N. Cooper, Phys. Rev., 104, 1189 (1956)). In the energy representation by relative coordinates

$$\tfrac{1}{2}(E_2 - E_1) = E, \quad \tfrac{1}{2}(E_2' - E_1') = E', \quad E_1 + E_2 = E_1' + E_2' = \mathcal{E},$$
$$\tfrac{1}{2}(k_2 - k_1) = k, \quad \tfrac{1}{2}(k_2' - k_1') = k', \quad k_1 + k_2 = k_1' + k_2' = \mathcal{K},$$

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the equation for the wave function of the bound two-electron state with total spin 0 for an electron-phonon system with Coulomb interaction takes the form

$$\psi(kE;\mathcal{K}\mathcal{E}) = \frac{1}{2\pi i}\int\limits_{-\infty}^{+\infty} dE' \frac{1}{V}\sum_{k'}\left(\frac{i}{\hbar}\right)^2 G\left(\frac{\mathcal{K}}{2}+k, \frac{\mathcal{E}}{2}+E\right)\times$$
$$\times G\left(\frac{\mathcal{K}}{2}-k, \frac{\mathcal{E}}{2}-E\right) I(kE, k'E', \mathcal{K}\mathcal{E})\,\psi(k'E', \mathcal{K}\mathcal{E}),$$

where $I(kE,k'E',\mathcal{K}\mathcal{E})$ is given by

$$I(kE, k'E') = \int\limits_{-\infty}^{+\infty} dt \int\limits_{-\infty}^{+\infty} dt_1 \int\limits_{-\infty}^{+\infty} dt_2 e^{\frac{i}{\hbar}Et - \frac{i}{\hbar}E'(t_2-t_1)} I(-k,0; k,t; -k',t_1; k',t_2), \qquad (3)$$

when $\mathcal{K} = 0$ and $\mathcal{E} = 0$. Using these equations, the problem of the bound state is investigated for the condition where $\mathcal{K} = 0$ and where $\mathcal{E}$ is sufficiently small. In this case, only G depends on $\mathcal{E}$; the dependence of I on $\mathcal{E}$ is disregarded. Furthermore

$$\varphi(kE;\mathcal{K}\mathcal{E}) = G^{-1}\left(\frac{\mathcal{K}}{2}+k, \frac{\mathcal{E}}{2}+E\right) G^{-1}\left(\frac{\mathcal{K}}{2}-k, \frac{\mathcal{E}}{2}-E\right)\psi(kE;\mathcal{K}\mathcal{E})$$

is substituted from the sum $\frac{1}{V}\sum_{k'}$ a transition is made to the integral $\frac{1}{2\pi^2}\int_0^{+\infty} k'^2 dk' \ldots$, and $I(kE, k'E')$ is replaced by $K(kE, k'E')$ averaged over the angle. This leads to the equation

$$\varphi(kE) = \frac{i}{4\pi^3}\int_0^{+\infty} k'^2 dk' \int_{-\infty}^{+\infty} dE\, K(kE, k'E')\left(\frac{i}{\hbar}\right)^2 G\left(k', \frac{\mathscr{E}}{2} + E'\right) \times \times G\left(k', \frac{\mathscr{E}}{2} - E'\right)\varphi(k'E'). \quad (4)$$

for which the asymptotic representation

$$\varphi(kE) = -\frac{i}{4\pi^3}\frac{k_F^2 Z^2(k_F)}{E'(k_F)} K(kE, k_F 0)\,\varphi(k_F 0)\ln\left(-\frac{4\omega^2 Z^2(k_F)}{|\mathscr{E}|^2}\right) - -\frac{i}{4\pi^3}\int_0^{+\infty} dk' \ln\frac{E'(k_F)|k' - k_F|}{\omega Z(k_F)}\frac{d}{dk'}\left(k'^2(k' - k_F) \times\right.$$

$$\times \int_{-\infty}^{+\infty} dE' K(kE, k'E') \left(\frac{i}{\hbar}\right)^2 G(k'E') G(k', -E') \varphi(k'E')\Big), \qquad (10)$$

is derived. For reasons of dimension convenience the arbitrary quantity ω which has the dimension of energy was introduced into this equation. The new unknown function

$$f(kE) = \frac{\varphi(kE)}{-\varphi(k_F 0)\, {}^1/_2 \ln\,(-4\omega^2 Z^2(k_F)/|\mathcal{E}|^2)}, \qquad (11)$$

also is introduced, from which $|\mathcal{E}|^2 = -4\omega^2 Z^2(k_F)\exp(2/f(k_F 0))$ is obtained for $k = k_F$. Equation (10) leads to

$$f(kE) = \frac{1}{2\pi^3} \frac{k_F^2 Z^2(k_F)}{E'(k_F)} K(kE, k_F 0) -$$

$$- \frac{i}{4\pi^3} \int_0^{+\infty} dk' \ln \frac{E'(k_F)\,|k' - k_F|}{\omega Z(k_F)} \frac{d}{dk'} \Big(k'^2 (k' - k_F) \times$$

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$$\times \int_{-\infty}^{+\infty} dE' K(kE, k'E') \left(\frac{i}{\hbar}\right)^2 G(k'E') G(k', -E') f(k'E') \Big). \qquad (13)$$

for $f(kE)$, which agrees exactly with the equation (12) in the previous study. The criterion of instability: From (12) it follows that in order to obtain a small value of $\mathcal{E}$ it is necessary and sufficient that $f(k_F 0)$ be small and negative. In this way the critical form of the interaction, for which an instability as to the formation of a superconducting electron pair occurs, is determined from the condition $f(k_F 0) = 0$. This criterion agrees with the one obtained in the previous paper, though there reached by a quite different approach, which proves the internal accordance of the theory of superconductivity.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

PRESENTED: May 29, 1962, by N. N. Bogolyubov, Academician

SUBMITTED: May 26, 1962

TOLMACHEV, V.V.

Problem of two-particle bound states for a nonideal Fermi-Dirac system. Dokl. AN SSSR 144 no.5:1015-1018 Je '62. (MIRA 15:6)

1. Fiziko-khimicheskiy institut imeni L.Ya.Karpova. Predstavleno akademikom N.N.Bogolyubovym.
(Quantum field theory)

TOLMACHEV, V.V.

A set of field equations for a nonideal Fermi-Dirac system taking explicitly account of two-particle bound states. Dokl. AN SSSR 147 no.1:84-87 N '62. (MIRA 15:11)

1. Predstavleno akademikom N.N. Bogolyubovym.
(Statistical mechanics) (Differential equations)

L 15465-63 EWT(1)/EWT(m)/BDS AFFTC/ASD

ACCESSION NR: 23005436 S/0020/63/151/005/1081/1084 54 53

AUTHOR: Tolmachev, V. V.

TITLE: Asymptotic expansions at weak interactions 19 in the vicinity of the critical temperature of phase transition in a modified formulation of the problem of a non-ideal Bose-Einstein system 21

SOURCE: AN SSSR. Doklady*, v. 151, no. 5, 1963, 1081-1084

TOPIC TAGS: phase transition, chemical potential, specific heat, non-ideal Bose-Einstein system, asymptotic expansion at weak interaction, asymptotic expansion, weak interaction

ABSTRACT: The method of asymptotic expansions suggested by the author in several previous papers is not adequate for dealing with temperatures close to the critical temperature of phase transitions, because the expansions do not converge uniformly in that region. In the present paper, the author considers the temperature range of the phase transition. It has been found that the chemical potential is a continuous function of temperature at the critical point. The free

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L 15465-63

ACCESSION NR: AP3005436

energy has been calculated (the results are not given). Specific heat is computed. Orig. art. has: 17 formulas.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical institute)

SUBMITTED: 28Jan63 DATE ACQ: 06Sep63 ENCL: 00

SUB CODE: PH NO REF SOV: 003 OTHER: 000

Card 2/2

ACCESSION NR: AT4041497 S/2910/63/003/01-/0047/0072

AUTHOR: Tolmachev, V. V.

TITLE: Method of Green's field functions in atomic and molecular problems

SOURCE: AN LitSSR. Litovskiy fizicheskiy sbornik, v. 3, no. 1-2, 1963, 47-72

TOPIC TAGS: field theory, Green function, Green field function, quantum theory, electron shell, perturbation theory, electron state, Wick theorem, Feynman diagram, Dyson Schwinger equation

ABSTRACT: The quantum field theory methods which are based on Green's functions permit a detailed mathematical study of multi-particle systems. The article presents the mathematical ideas behind this method, with applications to nonsingular states of electrons in an atom or a molecule. Specifically, the interest centers around the energy and the wave function of the characteristic state of the Hamiltonian, H, obtained from the nonsingular state of H_0 by adiabatic approximation of the interaction. Using the generalized Wick's theorem, as presented by Bogolyubov and Shirkov (GITTL, Moscow, 1957), a coupled chain of integral equations is obtained directly. From this chain the perturbation series for one-particle and two-particle Green functions is derived. Each term of this series corresponds directly to its proper Feynman diagram. Special formulas for the energy correc-

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ACCESSION NR: AT4041497

tion factor, ΔE, which allow the construction of the perturbation series for this factor from the knowledge of the perturbation series for Green's functions, is derived. A general set of rules for computation of the contribution of perturbation theory of arbitrary order to the energy ΔE and to the single-particle and double-particle Green's function is formulated by the use of Feynman diagrams. Comparison of the field perturbation theory with the ordinary perturbation theory shows that both give the same results for ΔE in the first two orders, assuming that the initial state of the Hamiltonian H_0 is nonsingular. For studies of the single-particle corpuscular aspect of the problem, the Dyson-Schwinger field equations are formulated from partial summations of the perturbation series for a one-particle Green function in terms of the Green's interaction function Q, the mass operator M, the polarization operator P and the apex operator Γ. For two-particle effects a new system of four field equations is derived in terms of the interaction operators S, I, J, and T. The operator I was previously considered by Bethe and Salpeter (Phys. Rev., 84, 1232, 1951) and the operators J and T were introduced by Ter-Martirosyan (Phys. Rev., 111, 948, 1958). Feynman diagrams are given for every equation. The boundary conditions for the two-particle system are not formulated. Use of the system for investigation of chemical bonds is suggested. "The author is indebted to Academician N. N. Bogolyubov for pointing out that both operators J and T were previously considered in the field theory of Ter-Martirosyan." Orig. art. has: 17 figures and 50 numbered formulas.

Card 2/3

ACCESSION NR: AT4041497

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova, Moscow (Physico-Chemical Institute)

SUBMITTED: 00 ENCL: 00

SUB CODE: GP, TD NO REF SOV: 004 OTHER: 010

Card 3/3

TOLMACHEV, V.V.

Weak-interaction asymptotic expansions for the vicinity of the critical phase transition temperature in the case of a modified formulation of the problem of a nonideal Bose-Einstein system. Dokl. AN SSSR 151 no.5:1081-1084 Ag '63. (MIRA 16:9)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova. Predstavleno akademikom N.N.Bogolyubovym.

(Phase rule and equilibrium)

TOLMACHEV, V.V.

Mass, polarization, and vertex operators in a modified formulation of the problem involving a nonideal Bose - Einstein system. Dokl. AN SSSR 153 no.3:566-569 N '63. (MIRA 17:1)

1. Fiziko-khimicheskiy institut im. L.Ya. Karpova. Predstavleno akademikom N.N. Bogolyubovym.

TOLMACHEV, V.V.

Modified and true formulations of the problem of a nonideal Bose - Einstein system of many particles. Dokl. AN SSSR 153 no.4:794-797 D '63. (MIRA 17:1)

1. Fiziko-khimicheskiy institut im. L.Ya. Karpova. Predstavleno akademikom N.N. Bogolyubovym.

TOLMACHEV, V. V.

"General Form of the Criterion of Superconductivity."

report presented at the Conference on Solid State Theory , Moscow, 2-11 Dec 1963.